Environmental, Health and Safety (EH&S)

Department of Energy - USA

Ministry of Science & Technology

PRC

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General Overview

- EH&S Issues
  - » EH&S issues for lead-acid batteries
  - » EH&S issues for advanced batteries
    - – Shipping
    - – Recycling
    - – In-vehicle safety

General Overview

- EH&S Cooperative Framework
  - » Federal Government Working Groups
    - – Advanced Battery Readiness Working Group
  - » Federal Government Environmental Law and Regulation
    - – Environmental Protection Agency (EPA)
    - – Department of Transportation (DOT)
    - – Occupational Safety and Health Administration (OSHA)

General Overview

- Infrastructure Working Council (IWC)
- Society of Automotive Engineers (SAE)

General Overview

- Possible links between U. S. and Chinese regulatory and environmental systems

EH&S Issues

EH&S Issues for Lead-Acid Batteries

- Batteries comprise 81% of U.S. consumption of lead
- New secondary lead recovery capacity needed, partly caused by EV waste
  - » Hydrometalurgical and electrowinning processes being implemented

EH&S Issues for Lead-Acid Batteries

- Air Emission Issues
  - National Ambient Air Quality Standard (NAAQS) for lead -- 1.5 micrograms/m^3 for 3-month average
  - California Air Resources Board (CARB) Standard -- 1.5 micrograms/m^3 for 1-month average

EH&S Issues for Lead-Acid Batteries

- Maximum Achievable Control Technology standard -- 2.0 mg/dscm (dry standard cubic meter)

- Back-up power systems can be used to ensure continuous emission control during power outage
  - U. S. plant back-up system can power plant up to one hour

EH&S Issues of Advanced Batteries

- Nickel Metal Hydride, Sodium Nickel Chloride, Lithium Ion, and Lithium Polymer batteries assessed
- Focus today on Nickel Metal Hydride batteries

Nickel Metal Hydride Batteries

- Safety: overcharge/overdischarge tolerance
- Shipping: starved electrolyte
  - » Some are classified as “dry”
- Recycling: classified as non-hazardous by EPA

EH&S Cooperative Environmental and Regulatory Framework

Federal Government Working Groups

- Advanced Battery Readiness Working Group
  - » Purpose
    - – To act as formally designated advisory body to DOE
    - – To assess regulatory requirements to ship, recycle, and operate batteries safely
    - – To develop action plans for commercialization

Advanced Battery Readiness Working Group

- Participants
  - » EPA, Department of Energy (DOE), Department of Transportation (DOT), California Air Resources Board (CARB)
  - » Automobile industry
  - » Battery Industry
  - » Electric Power Industry
  - » Recycling Industry

Advanced Battery Readiness Working Group

- Examples of accomplishments
  - » Shipping approvals in place for sodium and nickel - based batteries; proposal accepted by United Nations for lithium batteries

Advanced Battery Readiness Working Group

- Examples of Accomplishments
  - » Recycling advancements made for lithium ion batteries; 98% of lithium, 98% of cobalt, and much of the aluminum, iron, and nickel content recoverable

Advanced Battery Readiness Working Group

- Examples of Accomplishments
  - » Identified safety issues made into standards
    - – Issues: chemical exposure due to crash or rollover; failure of battery restraints or containment during crash
    - – Standard: Recommended Practice for Electric and Hybrid Vehicle Battery Systems Crash Integrity Testing

Environmental Law and Regulation

- EPA: Clean Air Act
- EPA: Clean Water Act
- EPA: Resource Conservation and Recovery Act
- DOT: Hazardous Materials Shipment Regulations
- OSHA: Permissable Exposure Limits

Infrastructure Working Council

- Purpose
  - » Recommend electric vehicle standards
  - » Serve as a problem-solving forum for electric vehicle infrastructure
  - » Serve as an information exchange between industries

Infrastructure Working Council

- Participants
  - » Automobile manufacturers
  - » Electric power industry
  - » Department of Energy; California Air Resources Board
  - » Industry associations
  - » Component manufacturers
  - » Standards organizations

Infrastructure Working Council

- Health and Safety Committee
  - » Emergency response training materials distribution
  - » 1999 National Electrical Code EV language
  - » 2000 International Building Code EV language
  - » Level 2 field tests complete; plans for Level 3 field tests

Infrastructure Working Council

- Connector and Connecting Stations
  - » Connector standardization
  - » High power charging
  - » Infrastructure development
    - – Smart card billing
    - – Review of CA and Massachusetts mandates

Infrastructure Working Council

- Load Management, Distribution and Power Quality Committee
  - » Assess EV charging billing methods
  - » Assess installation costs of EV charging infrastructure
  - » Power quality assessment of multiple chargers

Infrastructure Working Council

- Charging Controls and Communications Committee
  - » Model to simulate EV communications and control environment
  - » Development of generic supply equipment controller

Infrastructure Working Council

- Bus / Non-Road Committee
  - » Electric bus charging communications
  - » Electric bus and lift-truck ‘fast’ charging
  - » Electric bus and non-road vehicle charging connectors
  - » Electric bus and non-road vehicle infrastructure and standards

Society of Automotive Engineers

- Examples of Standards
  - SAE J1718: Measurement of hydrogen gas during battery charging
  - SAE J2288: Life cycle testing of EV battery modules
  - SAE J1673: High voltage automotive wiring assembly design

U. S. and Chinese System Links?

- Cities identified for EV introduction?
  - National government role?
  - Local government role?
  - Electric power industry role?
  - Recycling capability in place? Can it accommodate vehicles and batteries?
  - Battery shipping currently taking place?

U. S. and Chinese System Links?

- Applicability of Working Group or Infrastructure Council?
  - » Assemble industry and government to plan for infrastructure
  - » Changes required to existing law or regulation to provide for electric vehicles?
    - – Motor vehicle standard
    - – Waste disposal/recycling regulations

EH&S Cooperative Environmental and Regulatory Efforts